

# Status of the Beam Parameter Document and Relevant Code

Prof. Luke A. Corwin  
NuMI-X docDB-20

South Dakota School of Mines & Technology

October 21, 2013

- 1 Introduction
- 2 Relevant Code
- 3 Changes Since Previous Version
- 4 Location
- 5 Future

# Introduction

## Description

- The Beam Parameter Document contains current information on various beam parameters.
- Since it was developed in the context of the NOvA experiment, it also contains NOvA detector positions
- The official version **was** NOvA-doc-5485.

## Recent Version History

- The current Version (15) was uploaded on Sep. 30, 2013
- Version 14 was uploaded on Oct. 19, 2012

# FLUGG Simulation

- All of the beam parameter information is used in the FLUGG Simulation.
- The near and far detector locations are used in `g4numi_flugg/for/mgdraw.f.nova` in the variables `xNear`, `xFar`, etc.
- Other beam parameters are mostly stored in `g4numi/src/*.cc` and `g4numi/src/*.cc.me_target`
- For example, the Horn 2 z-position is stored in the variable `horn2_z` in `g4numi/src/NumiDetectorConstruction.cc.me_target`

# novasoft

- While the FLUGG parameters are common to NuMI, the NOvA detector positions are stored in `novasoft`.
- The locations from Table 2 of the parameter sheet correspond to the values stored in the array `_simpleTranslation` from the function `CoordinateTransformation::setCoordinateParameters()` in the Geometry package.

# Magnetic Declination (Table 6)

v. 14

Detector	Magnetic Dec.	$\Delta(\text{Dec.})/\Delta t$	True N Orientation
NDOS	$-3^{\circ}1' \pm 30'$	$-5'/\text{yr}$	$-23^{\circ}48'39'' \pm 14'2''$
Far	$-0^{\circ}13' \pm 30'$	$-6'/\text{yr}$	$-27^{\circ}51'26'' \pm 5'51''$

v. 15

Detector	Magnetic Dec.	$\Delta(\text{Dec.})/\Delta t$	True N Orientation
NDOS	$-3^{\circ}14' \pm 30'$	$-5'/\text{yr}$	$-23^{\circ}48'39'' \pm 14'2''$
Far	$-0^{\circ}29' \pm 30'$	$-6'/\text{yr}$	$-27^{\circ}51'26'' \pm 5'51''$

# Horn 2 Position (Table 8)

v. 14	Horn 1	Horn 2
Start of idealized Horn	$z = 0.00$ m	19.204775 m
Horn Insertion Point	$z = 0.03$ m	19.204775 m
Current	200 kA	200 kA

v.15	Horn 1	Horn 2
Start of idealized Horn	$z = 0.00$ m	$z = 19.1779$ m
Horn Insertion Point	$z = 0.03$ m	$z = 19.1779$ m
Current	200 kA	200 kA

Currently, `horn2_z=19.204775m` in FLUGG. This needs to be updated.

# Near Detector Position (Table 2)

In BPD v. 14 and 15

Detector	$x$	$y$	$z$
Near Underground $3 \times 3$	11.57 m	-3.64 m	993.35 m

In `CoordinateTransformation.cxx`

```

00246     if      (detector_id == novadaq::cnv::kNEARDET)
00248         _simpleTranslation[0] =  11.414  * CLHEP::m;
00249         _simpleTranslation[1] = -3.456   * CLHEP::m;
00250         _simpleTranslation[2] =  994.665 * CLHEP::m;
...
00254     }
```

This needs to be updated in the `novasoft` code.



# Near Detector Position (Table 2)

In BPD v. 14 and 15

Detector	$x$	$y$	$z$
Near Underground $3 \times 3$	11.57 m	-3.64 m	993.35 m

In `CoordinateTransformation.cxx`

```

00246 if (detector_id == novadaq::cnv::kNEARDET) {
00248   _simpleTranslation[0] = 11.414 * CLHEP::m;
00249   _simpleTranslation[1] = -3.456 * CLHEP::m;
00250   _simpleTranslation[2] = 994.665 * CLHEP::m;
...
00254 }
```

This needs to be updated in the `novasoft` code.

# Document Location

- This official version is in NOvA-doc-5485, and it is visible only to NOvA
- Ideally, MINOS+, NOvA, and all other NuMI experiments would have one common document.
- Alex Sousa uploaded a copy of NOvA-doc-5485v15 as MINOS-doc-10175-v1. This is not a sustainable solution
- After discussion at the NOvA Collaboration Meeting, we decided that the official version is now NuMIX-doc-17.
- NuMIX-doc-17v1 is identical to NOvA-doc-5485v15 and v16.

# Upcoming Changes

- Code updates discussed earlier.
- Possible addition of parameters suggested by other collaborators
- Precision survey of Near Detector after it is complete
- Handing off of maintenance of this document